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Technical/Final Report
to
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A Serological, Hematological, Parasitological and Biochemical Survey of Domesticated Elk Herds

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Abstract

Elk ranching in Saskatchewan is in its infancy. Herd health and herd management are a key ingredient required for the prosperity of the industry.

The serological, hematological, biochemical survey of domesticated elk herds in Saskatchewan has provided a list of normal values as the result of an analysis of 89 blood samples. The normal white blood cell, red blood cell and platelet counts, plus clinical chemistry and copper values are now known for elk.

These results can be used as a normal base by which diseased or nutritionally deficient animals can be evaluated. Blood samples from individuals or herds can be analyzed by the equipment used for all other species of animals and these normal values can be used to reduce potentially high economic losses to game ranchers.

Serum samples are stored for possible future serological studies.

Title:

A Serological, Hematological, Parasitological and Biochemical Survey of Domesticated Elk Herds in Saskatchewan.

Nature and Scope of Problem:

With expansion of game farming in Saskatchewan, it is important to determine normal values for this population for future comparative studies as well for herd health purposes.

Objectives:

1) Establish normal hematological and biochemical values for domesticated elk.

2) Obtain serum samples for serological data collection on potential infectious disease exposure.

3) Store and freeze serum samples for retrospective serological studies on infectious diseases which may be epidemiologically significant in the future.

Experimental Design:

1) Collect epidemiological data on all herds sampled, identifying animals with ear tags if necessary.

2) Blood samples will be collected when testing is required for movement or sale between provinces or for export.

3) Routine laboratory testing will be done at the Provincial Laboratory in Regina or W.C.V.M. with the exception being Leptospirosis titres which will be sent to Lethbridge (Agriculture Canada).

4) A total of 100 samples will be collected for testing purposes.

5) TESTS TO BE COMPLETED:

a) Complete blood counts.
b) Large animal chemistry profile.
c) T4
d) Iron and T.I.B.A.
e) Electrophoresis
f) Copper
g) Vitamin A
h) Vitamin E
i) Selenium
j) Progesterone (females)
k) Fecal ova and parasites
l) Serology: B.V.D., I.B.R., R.S.V., Leptospirosis, Brucellosis.

Other serological tests to be done on frozen serum as determined by investigators.

Result Interpretation:

A total of 89 elk samples were analyzed using the Technicon RA 500. The large animal data base was used as a guideline to perform 18 x 89 = 1,602 clinical chemistry tests. Copper levels were analyzed in 17 serum samples. The Technicon H1 was used to perform hematological analysis of 84 elk blood samples. The analysis included white blood cell, red blood cell and platelet counts. Differential white blood counts were also performed by the H1. Blood samples were sent to Agriculture Canada for Brucellosis testing.

The average ranges of testing results are as follows:

A. Clinical Chemistry

Normal Ranges for Elk (Bovine in Parantheses)

	Mean	Low Range - High Range		Standard Deviation
Total Protein g/L	71	61 (60)	81 (80)	10
Albumin g/L	41	36 (23)	46 (37)	5
Globulin g/L	31	20	43	12
A/G	1.55	0.92	2.18	0.63
Urea mmol/L	7.7	5.6 (2.0)	9.8 (9.5)	2.09
Creatinine umol/L	165	135 (88)	195 (237)	30
Glucose mmol/L	7.5	5.8 (1.9)	9.2 (3.1)	1.7
CK U/L	349	237 (00)	461 (500)	112
AST U/L	96	60 (50)	132 (150)	36
ALP U/L	305	184 (35)	426 (450)	121
Bili T umol/L	11	7 (0)	15 (32)	4
Ca mmol/L	2.55	2.31 (2.0)	2.79 (2.62)	0.24
P mmol/L	2.28	1.18 1.3)	2.68 (2.25)	0.4
Na mmol/L	141	135 (132)	147 (152)	6
* K mmol/L	10.4	9.1 (3.9)	11.7 (5.8)	1.30
Cl mmol/L	103	99 (95)	107 (110)	4
Mg mmol/L	0.96	0.76 (0.50)	1.16 (1.45)	0.2
Cu umol/L	15.5	12.5 (10.9)	18.5 (20.3)	3.0

Chemistry Observations:

1) Results of elk were comparable to bovine values.
2) Albumin and phosphorus levels in elk were higher than bovine.
3) Coppers were good in comparison to bovine results.
* 4) Potassium results were invalid as the values were too high in comparison to bovine values and glucose values indicated hyperglycemia or stress.

B. **Hematology**

Elk Normal Values (in Comparison to Bovine)

	Elk Normal Range	Bovine Normal Range
Hemoglobin	114.0 - 153.0 g/L	80 - 150 g/L
Hematocrit	30.0 - 41.0 L/L	0.24 - 0.46 L/L
Red Blood Cells	6.91 - 9.23 x 10^{12}/L	5.0 - 10.0 x 10^{12}/L
Mean Corpuscular Volume	42.1 - 44.6 fL	40 - 60 fL
White Blood Cells	4.57 - 7.67 x 10^{9}/L	4.0 - 12.0 x 10^{9}/L
Platelets	195.0 - 451.0 x 10^{9}/L	100.0 - 800.0 x 10^{9}/L
Neutrophils	19 - 69%	15 - 45%
Bands	0 - 2%	0 - 2%
Lymphocytes	15 - 77%	45 - 75%
Monocytes	0 - 4%	2 - 7%
Eosinophils	0 - 11%	2 - 20%
Basophils	0 - 1%	0 - 2%

Hematology Sample Observations:

1) The use of H-1 RBC cytogram in this case helped us to more accurately establish our normal range by eliminating one low sample which had an obvious regenerative anemia on the RBC size plot.

2) Peroxidase staining is similar to that of bovines. The basophil lobularity channel depicted a backward curved tail which was consistently seen on all samples.

3) Differentials are <u>not</u> established because fresh air dried smears were not included for accurate differentials.

4) Different gains should be used on Peroxidase and Basophil lobularity channels for elk.

5) Excellent separation of Eosinophils was made on the H-1 on only two blood samples: 63 and 73. Other samples show fusion with neutrophils. Is there any chance that these are not elk??

6) Comparison between the H-1 and Coulter Counter revealed:

   i) Hemoglobin values on the average were 3 - 6 g/L higher on the H-1.
   ii) Higher PCV were seen on the H-1 which averaged out to 2 L/L.
   iii) RBC values were higher on the H-1 by an average of 0.93×10^{12}/L.
   iv) MCV on the H-1 were on the average 3.96 femtoliters less than the Coulter.
   v) WBC's were consistently lower on the H-1 by an average of 1.8×10^{9}/L.

<u>Conclusions:</u>

The game farming industry has excellent potential in Saskatchewan. Disease is a very important consideration in management and herd health programs.

Eighty-nine samples were collected from elk to establish normal hematological and biochemical values. The test results are representative of normal healthy elk and can now be used as a baseline for diagnostic evaluation of samples from unhealthy elk.

Serum samples also verified that Brucellosis was not present in the herd.

Serological studies on infectious diseases were not done.

Serum samples have been frozen and stored at the Regina Veterinary Pathology Laboratory and are available for future serological studies.

The studies have established normal values for elk. These values will form a basis for diagnoses of disease and nutritional deficiencies. The potential economic impact in preventing serious financial loss to game farmers is difficult to measure, but could be large if the game farming industry grows as it is expected to.

Practical Recommendations:

The values listed form the basis for all labs and veterinarians in analysis of blood samples in the diagnosis of disease and nutritional deficiencies in elk.

Publications:

The report data will be forwarded to Dr. Bill Yates for publication in the Canadian Veterinary Journal and to Dr. Jerry Haigh for publication in the game farming newsletters.

Statement of Expenditures:

1)	Veterinary fees	$1,250.00
2)	Laboratory charges	2,592.00
3)	Cooler and centrifuge	0
4)	Blood tubes, slides, etc.	116.75
5)	Programming costs	0
6)	Travel - mileage	120.00
	- transportation	30.00
7)	Phone	25.00
8)	Secretarial, etc.	150.00
		$4,283.75

Personnel:

1) Ryan Clark - Elk Rancher.
2) Dr. Alex McIsaac - Veterinarian (Wawota).
3) Dr. Norman Lowes, Veterinary Pathologist, Veterinary Branch.

Equipment:

No equipment was purchased.